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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/065,044	09/13/2002	Ray Fli Lee	RD-29708	2581

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GENERAL ELECTRIC COMPANY
GLOBAL RESEARCH CENTER
PATENT DOCKET RM. 4A59
PO BOX 8, BLDG. K-1 ROSS
NISKAYUNA, NY 12309

EXAMINER

VARGAS, DIXOMARA

ART UNIT	PAPER NUMBER
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2859

DATE MAILED: 12/08/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

GA

Office Action Summary	Application No.	Applicant(s)	
	10/065,044	LEE ET AL.	
	Examiner	Art Unit	
	Dixomara Vargas	2859	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-6,9-18 and 21-24 is/are rejected.
- 7) ☒ Claim(s) 7,8,19 and 20 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 September 2002 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>2</u> . | 6) <input type="checkbox"/> Other: |

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: #16. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.
2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: #145 and #180. A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-5, 9-17, 21-22 and 24 are rejected under 35 U.S.C. 102(b) as being anticipated by Jakob et al. (US 6,289,232 B1).

With respect to claims 1 and 13, Jakob discloses a method for reconstruction for use in a parallel MRI system wherein a plurality of MR detector coils are arranged in an array (Abstract)

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and each coil has a corresponding spatial sensitivity profile, the method comprising (Column 10, lines 17-36): detecting a plurality of gradient-encoded MR signals from the plurality of detector coils (Column 10, lines 37-55; Figure 1, #20a, #20b ... and #20i); and, processing the detected MR signals with at least one filter bank to reconstruct at least one image (Column 21, lines 52-56; Figure 1, #18).

5. With respect to claims 2 and 14, Jakob discloses the step wherein the plurality of MR detector coils comprises a spatial filter bank formed with the respective sensitivity profiles for spatially filtering the plurality of detected MR signals (Columns 10 and 21, lines 17-36 and 52-56 respectively).

6. With respect to claims 3 and 15, Jakob discloses the step wherein the detector coils are arranged to optimize the spatial encoding of the spatial filter bank (Column 10, lines 37-55; Figure 1, #20a, #20b ... and #20i).

7. With respect to claims 4 and 16, Jakob discloses the step of using the SMASH method (this method uses a numerical fitting routine to, among other things, interpolate a decimated number of phase-encoding steps and thus, achieve reductions in scan time) which is considered to be the claimed step that involves collecting a decimated plurality of gradient-encoded MR signals to generate a plurality of decimated signals, and the processing step comprises the steps of; interpolating the plurality of decimated signals to generate a plurality of interpolated signals (Column 8, lines 37-67), and, applying at least one of a lapped transform and a synthesis filter bank to reconstruct interpolated signals (Column 6, lines 50-67).

8. With respect to claims 5 and 17, Jakob discloses the step wherein the decimated gradient encoding consists of reduced phase encoding steps (Column 10, lines 37-55).

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9. With respect to claims 9 and 21, Jakob discloses the step wherein the at least one image is substantially free of aliasing and amplitude distortion (Column 21, lines 59-67).

10. With respect to claims 10 and 22, Jakob discloses the step wherein the sensitivity profiles of the array are overlapping and further comprising the step of applying a lapped transform to the detected signals during the processing step (Column 23, lines 20-48; Figure 1B).

11. With respect to claim 11, Jakob discloses the step wherein the array is a strip array comprised of a plurality of array elements each element being a linear strip (Figure 1B, C1-C4).

12. With respect to claims 12 and 24, Jakob discloses the step wherein the array comprises a strip array of a plurality of conductive strips, each strip having a corresponding phase relationship to a spatial location within an object to be imaged in the MRI system and the processing step comprises encoding each of the corresponding phases to reconstruct the at least one image (Abstract; Figure 1B).

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

14. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out

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the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

15. Claims 6 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jakob et al. (US 6,289,232 B1) in view of Pelc et al. (US 5,653,233 A).

With respect to claims 6 and 18, Jakob discloses the claimed invention as stated above in paragraph 4 except for the step wherein the decimated gradient encoding consists of collecting sparse subsets of non-rectilinear trajectories in k space, the subsets comprising at least one of a reduced number of interleaves of an interleaved-spiral trajectories and a reduced number of radial lines of a radial trajectory. However, Pelc discloses the step of collecting sparse subsets of non-rectilinear trajectories in k space, the subsets comprising at least one of a reduced number of interleaves of an interleaved-spiral trajectories and a reduced number of radial lines of a radial trajectory (Column 5, lines 59-65). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to perform the steps of collecting sparse subsets of non-rectilinear trajectories in k space, the subsets comprising at least one of a reduced number of interleaves of an interleaved-spiral trajectories and a reduced number of radial lines of a radial trajectory as taught by Pelc with Jakob's method of reconstruction usable in parallel MRI systems for the purpose of obtaining the necessary spatial resolution and FOV so as to improve the resolution in dynamic studies.

16. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jakob et al. (US 6,289,232 B1) in view of Ochi et al. (US 5,808,467 A).

With respect to claim 23, Jacob discloses a coil system wherein the array is a strip array comprised of parallel strips of conducting material (Figure 1B, C1-C4). In addition, Jakob discloses the claimed invention as stated above in paragraph 4 except for the coil array connected to a ground plane by capacitors. However, Ochi discloses the coil array connected to a ground plane by capacitors (Figure 19). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to connected the coil array to a ground plane by capacitors as taught by Ochi with Jakob's parallel MRI system for the purpose of tuning the coil to an MR frequency.

Allowable Subject Matter

17. Claims 7, 8, 19 and 20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

18. The following is a statement of reasons for the indication of allowable subject matter:

- a. With respect to claims 7 and 19, the claims have been found allowable over the prior art because the prior art fails to teach or fairly suggest a method of reconstruction usable in parallel MRI systems comprising an intermediate filtering step of applying an intermediate filter bank between the decimated gradient encoding and interpolating steps for stabilizing the processing step for reconstructing the at least one image.
- b. With respect to claims 8 and 20, the claims have been found allowable due to its dependency on claim 7 and 19 above.

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Conclusion

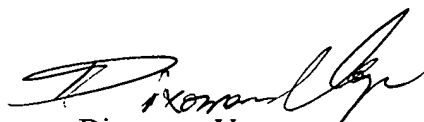
19. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The additional prior art cited in the PTO 892 discloses MRI systems with multiple receivers comprising a sensitivity profile and a reconstruction filter.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dixomara Vargas whose telephone number is (703) 305-5705.

The examiner can normally be reached on 8:00 am. to 4:30 pm..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez can be reached on (703) 308-3875. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.



Dixomara Vargas
Art Unit 2859
December 4, 2003



Diego Gutierrez
Supervisory Patent Examiner
Technology Center 2800